LAT-1 Laser Alignment Tool

Visible Laser Device for Aligning Light Screen and Grid Systems

LAT-1-US shown

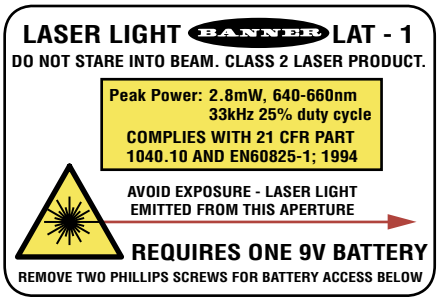
Features

- Totally self-contained visible-beam laser tool simplifies the alignment of any opposed-mode sensor pair, especially in applications that include long distances or corner mirrors
- Reduces the time required to align light screen systems and corner mirrors; eliminates much trial-and-error guesswork when working with infrared beams
- Uses one common 9-volt battery (included)
- Built-in circular bubble level
- One 4" x 4" square of high-grade retroreflective target material included for easy viewing of the laser spot at long distances
- Mounting clip (available separately or as part of a kit; see below) snaps squarely onto the housings of Banner safety light screen/grid emitters and receivers

Caution . . .
Laser Light Can Damage Your Eyes

- View only the diffuse image of the laser beam where it strikes the alignment target.
- Always view the laser image from behind the LAT-1.
- Never look directly into the laser lens or into a mirror reflection of the laser light beam.

See alignment procedure for more information. Failure to follow these guidelines can result in vision damage.



Models

Emitter/Receiver Housing	LAT-1 with Clip(s) Kit		Clip Only	
	Model	P/N	Model	P/N
MINI-SCREEN®	**LAT-1-MS**	71442	**MSA-LAT-1**	57708
MICRO-SCREEN®	**LAT-1-US**	71443	**USA-LAT-1**	57709
EZ-SCREEN™	**LAT-1-SS**	71445	**EZA-LAT-2**	71446
EZ-SCREEN™ Type 2	**LAT-1-LS**	73745	**LSA-LAT-2**	73747
MINI-SCREEN® H.D., EZ-SCREEN™ Grid or Point	**LAT-1-HD**	71444	**EZA-LAT-1**	66027
All of the Above	**LAT-1**	52150	–	–
PICO-GUARD™ SFP12 Safety Points	**LAT-1-SFP12**	71847	–	–
PICO-GUARD™ SFP30 Safety Points	**LAT-1-SFP30**	72999	–	–

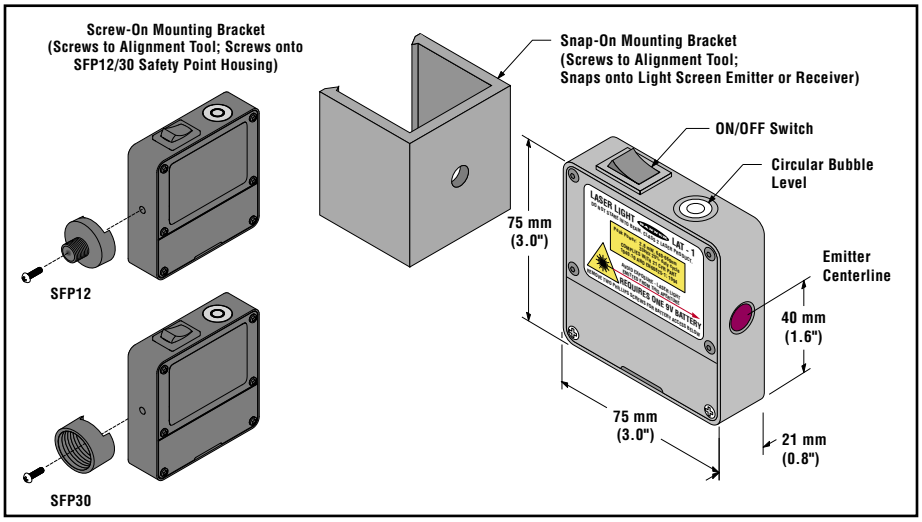


Figure 1. Laser Alignment Tool features and dimensions

LAT-1 Laser Alignment Tool

Specifications

Supply Voltage and Current	One standard 9V battery, included (replaceable); approximately 20 hours of continuous operation
Sensing Beam	Class 2 laser, 640-660 nm visible red IEC **Pulse Width:** 7 µs **Rep rate:** 30 µs **Peak output power:** 2.8 mW, 33kHz, 25% duty cycle
Beam Size at Aperture	Approximately 2 mm (0.08") diameter
Beam Divergence	± 1.0 milliradian within specified temperature range ± 0.5 milliradians at room temperature
Beam Placement	Within ± 4 milliradians (approximately ±0.25 degrees) of parallel to front, back, top and bottom of housing
Construction	Aluminum housing; black anodized finish Black polypropylene cover with flexible hinge for battery access
Environmental Rating	NEMA 1; IEC IP50
Operating Conditions	**Temperature:** 0° to +40°C (+32° to 104°F) **Maximum Relative Humidity:** 90% @ +50°C (non-condensing)
Laser Classification	U.S. Safety Standards 21 CFR 1040.10 European Standards EN 60825-1:1994
Application Notes	See Caution on page 1 regarding safe use of laser beam.

Alignment Procedure

To align a safety light screen using the LAT-1:

1. Mount all sensors and corner mirrors per the instructions in the appropriate manual. Leave the hardware slightly loose to allow for positioning adjustment.
2. Assemble the appropriate clip to the LAT-1; snap it onto the light screen emitter or receiver, and slide it to one end of the sensor. (HINT: Check the receiver for plumb first, before attaching the LAT-1 to the emitter for alignment.) Attach a retroreflective target to the corresponding end of the opposite sensor.
3. If the sensors are mounted vertically, check the circular bubble level for plumb orientation.
4. Standing behind the Alignment Tool, view the retroreflective target from behind the sensor (see Figure 2). Adjust either or both sensors and/or the corner mirrors as needed to place the laser image at the desired spot on the opposite sensor.
5. Move the Alignment Tool and the retroreflective target to the opposite ends of the sensors and repeat step 4.
6. Repeat steps 4 and 5 until the image falls at the desired spot at both the top and bottom of the opposite sensor; then tighten all mounting hardware.

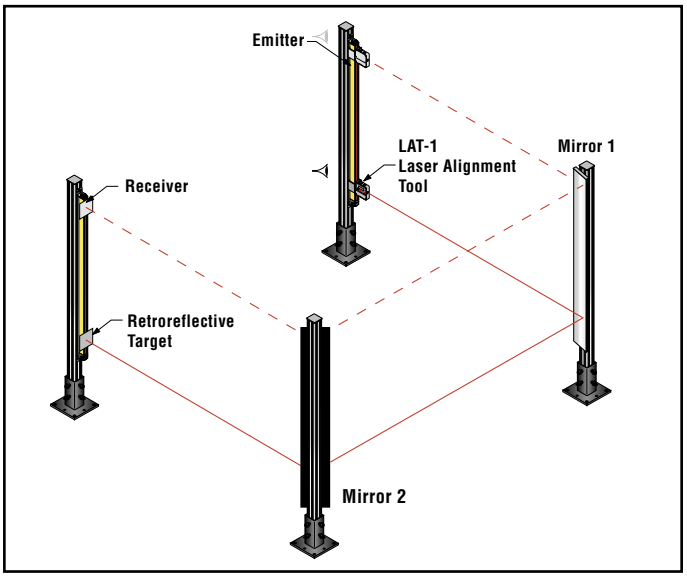


Figure 2. Aligning a corner-mirror light screen application using the Laser Alignment Tool

BANNER®
the machine safety specialist

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P/N 54599 rev. C

BEAM TRACKER™ MODEL BT-1 BEAM TRACKER

PHOTOELECTRIC DIAGNOSTICS SENSOR

BANNER
the photoelectric specialist

Model BT-1 BEAM TRACKER Features:

- **A quick and simple way to evaluate photoelectric system performance**
- **Receives light from all modulated photoelectric emitters and transmits light to receivers to check system operation**
- **A valuable tool for locating the center of the beam when installing long-range opposed mode photoelectric sensor pairs**
- **Locates sources of severe EMI or RFI "noise"**
- **Low cost, battery operated, and completely self-contained**

The Banner Beam Tracker model BT-1 provides an easy means for troubleshooting any modulated photoelectric system. It is a small, wireless sensor which will receive *any* modulated photoelectric light source. It *also* has a built-in high frequency emitter that will be detected by any Banner photoelectric receiver, as well as by those of most other photoelectric manufacturers.

The Beam Tracker includes Banner's exclusive Alignment Indicating Device™ (patent #4356393) which displays the relative strength of the light which it receives from a modulated source. When the receive button is depressed, an LED indicates the presence of a modulated light beam and flashes at a rate which corresponds directly to the beam's intensity. As a result, a suspected weak or failed light source is easily verified.

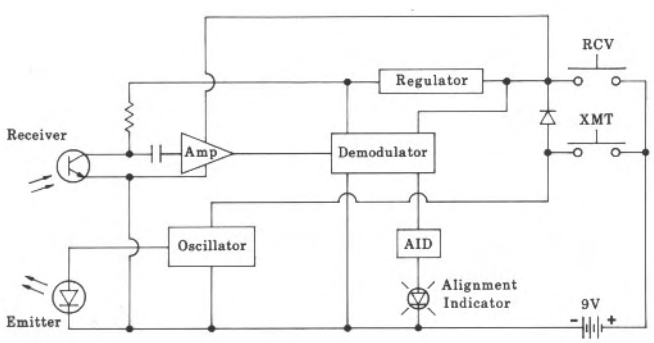
The Beam Tracker provides a fast and accurate way to check sensor alignment in opposed photoelectric systems. It is a valuable tool for locating the center of a beam when installing long range opposed pairs. The Beam Tracker may also be used to quickly check for light output from any infrared remote control.

When the transmit button is pushed, the Beam Tracker emits a 70 kHz modulated infrared beam. Most modulated photoelectric receivers, if functioning properly, will respond to this beam at close range.

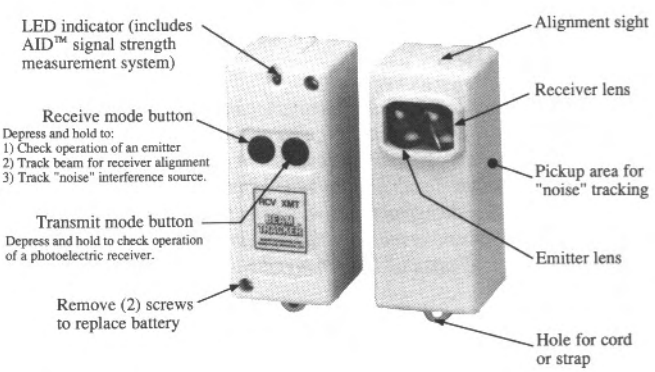
The Beam Tracker has another very useful diagnostic function. In the receive mode, the Beam Tracker will respond to a severe level of electromechanical or radio frequency interference. The path to the "noise" source can be traced by observing the flash rate of the Beam Tracker's Alignment Indicating Device.

The Beam Tracker is housed in a rugged Valox® case which includes an aiming sight, plus a convenient mounting hole for a strap or a cord. Model BT-1 is completely self-contained and is powered by a standard 9 volt battery which provides about 10 hours of continuous use (or, typically, hundreds of tests). If you have a question about the use of the Beam Tracker or about any product in the complete line of Banner sensors, please contact the applications group at Banner Engineering or your local Banner sales engineer.

FUNCTIONAL SCHEMATIC



BEAM TRACKER FEATURES



Printed in USA

P/N 03490

INFORMATION FOR USE OF THE MODEL BT-1 BEAM TRACKER

RECEIVE MODE

A.) Checking Modulated Emitters:
The light from any *modulated* emitter will be sensed by the Beam Tracker. To check an emitter, depress and hold the "RCV" button located on the rear of the Beam Tracker case (see photo). When the "RCV" button is first depressed, the indicator LED will blink once to indicate that the Beam Tracker is ready to receive a signal. Point the lens of the Beam Tracker directly at the emitter to be tested. A functioning emitter will light the Beam Tracker's indicator LED. No response of the indicator LED suggests failure of the emitting element or of the emitter's modulation (oscillator) circuitry.

The Beam Tracker includes Banner's exclusive Alignment Indicating Device which displays the relative intensity of a modulated light source. The indicator LED flashes at a rate which is directly proportional to the amount of modulated light which is gathered in by the Beam Tracker's lens. A pulse rate of about one per second indicates a marginal amount of light signal. A steady "on" condition of the LED occurs at pulse rates higher than about 20 per second. The Beam Tracker cannot be used to measure excess gain, since gain is determined by the amplifier and by the optical characteristics of the receiver actually to be used in the sensing system.

B.) Emitter-Receiver Alignment
The biggest problem when using separate emitters and receivers is marginal alignment. The Beam Tracker is used as a tool during installation of opposed photoelectric sensor pairs. At ranges within a few feet, most modulated systems have enormous power, which makes alignment very simple. However, it often is important to optimize alignment, even at close range, where high excess gain is needed to "burn through" contamination.

The Beam Tracker is particularly useful for aligning emitter-receiver pairs at long range. First, power is applied to the emitter, which is mounted in place. With the "RCV" button held down, the Beam Tracker is moved up-down-left-right to "feel" the beam, while walking slowly back to the receiver location. The Beam Tracker will sense the beam of a Banner emitter with approximately the same sensitivity as the equivalent Banner receiver. If the beam is lost, the sight at the top of the case can be used to help re-establish beam tracking. At the receiver location, the Alignment Indicating Device is used to find the center of the beam.

With the center of the beam located, the Beam Tracker is *rotated* up-down-left-right to determine the best *angular* position for the receiver. At long scanning distances, accurate angular sensor alignment is even more important than vertical and horizontal placement. Once the receiver has been permanently mounted, fine adjustment may be made by using the receiver's own Alignment Indicating Device (if available), or by temporarily reducing the receiver's sensitivity, in steps, until alignment can no longer be improved.

TRANSMIT MODE

The Beam Tracker includes a high frequency infrared (invisible) emitter which will be recognized at short range by most modulated photoelectric receivers, including *all* Banner receivers. To check receiver operation, point the Beam Tracker directly at the lens of the receiver and depress the "XMT" button. A working receiver will respond to the Beam Tracker's modulated beam, as confirmed by the receiver's alignment indicator and/or by a change of state of the receiver's output.

The indicator LED of the Beam Tracker will be "on" and flashing slowly whenever the "XMT" button is depressed. Failure of the LED to light when in the transmit mode indicates that the battery should be replaced.

The Beam Tracker should be held within a few inches of the lens of any receiver under test. The transmit mode of the Beam Tracker cannot be used to test a receiver for its range specification.

NOISE TRACKING

By design, the Beam Tracker is sensitive to electrical "noise", both EMI and RFI. This allows the Beam Tracker to be used to locate the source of severe levels of interference that could cause false operation of electronic equipment like sensors, counters, data recorders, and programmable logic controllers.

To locate a suspected noise source, the Beam Tracker is used in the receive mode ("RCV" button depressed). If necessary, the receiver lens of the Beam Tracker (see photo) should be covered to prevent response to any modulated light in the area, including any light from florescent fixtures. The noise pick-up area is on the side of the housing, next to the "RCV" button (see photo). When a high level of steady noise is detected, the Beam Tracker's Alignment Indicator Device LED will light and flash at a rate which is proportional to the strength of the interference.

Most steady noise sources can be tracked down by moving the Beam Tracker in all directions, while observing the flash rate of the Alignment Indicating Device. Electromagnetic interference (EMI) is readily coupled to and conducted along cables, and so the source of EMI is often discovered by tracking along wireways. It is normal in these situations for the interference level to alternately rise and fall along a long cable or wireway. However, the average flash rate of the Alignment Indicating Device will increase as the noise source is approached. Common sources of EMI include lighting fixtures and controls, motors, generators, and contactors.

EMI emissions are distributed uniformly across the radio frequency spectrum. RFI, however, occurs most often at a specific frequency or within a narrow band of frequencies. As a result, one electronic instrument may be radically affected by the presence of RF interference, while another similar instrument in the same area may appear completely immune. The Beam Tracker is designed to respond to RFI falling anywhere within the common RF spectrum, and can easily track any source of RFI. Severe levels of RFI are usually tracked across open areas. The pulse rate of the Beam Tracker's Alignment Indicating Device will increase rapidly as the RF noise source is approached. Common generators of RFI include in-plant two-way radios, stepper motor controls, computers, and CRTs.

Not all sources of noise are continuous. For example, an arcing relay may emit a burst of EMI *and* RFI when its contacts open. If a burst of noise occurs while the Beam Tracker's receiver is on (i.e., while the "RCV" button is being held down), the noise will appear as a quick flash of the Beam Tracker's indicator LED. An intermittent noise source may be tracked by relating the flash of the Beam Tracker's LED to an electromechanical event or sound (e.g. - a machine indexing, a motor starting, etc.).

BATTERY REPLACEMENT

The battery may be checked at any time by simply depressing the "XMT" button. A good battery will light the indicator LED on the Beam Tracker. The LED will pulse at a slow rate, even when no modulated light is reaching the lens. The battery is easily replaced by removing the two screws which are accessible at the back of the housing (see photo). The Beam Tracker uses a common style 9 volt (NEDA 1604) battery. An alkaline battery will yield over ten hours of continuous use.

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